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Advanced Triage Protocols in the Emergency Department

Lijuan Zhao
Walden University

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Walden University

College of Health Sciences

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Lijuan Zhao

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and that any and all revisions required by
the review committee have been made.

Review Committee

Dr. Janice Long, Committee Chairperson, Health Services Faculty
Dr. Catherine Garner, Committee Member, Health Services Faculty
Dr. Yolanda Coleman, University Reviewer, Health Services Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2016

Abstract

Advanced Triage Protocols in the Emergency Department

by

Lijuan Zhao

MSN, Walden University, 2015

BSN, Excelsior College, 2012

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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May 2017

Abstract

Overcrowded emergency departments (EDs) are a major problem in the United States resulting in inefficiency in operation and performance. A Southern California hospital ED was the site for this project because it had operated over its maximum capacity during the last decade. Advanced triage protocols integrating standard order sets were implemented to improve quality of care; however, no evaluation of the protocols had been done. The purpose of this project was to evaluate the effect of the advanced triage protocols. Two project questions determined whether advanced triage protocols reduced ED length of stay (LOS), number of patients who left without being seen (LWBS), and improved patient experience. The Lean Principles and the Plan-Do-Study-Act Model for Improvement were used to guide the project. A pre- and post-implementation design found that ED LOS had a significant 17-minute decrease for ESI Level 3 patients (225.7 ± 8.6 minutes vs. 208.8 ± 6.9 minutes, $p = .002$), and significant 13-minute decrease for ESI Level 4 patients (146.5 ± 1.6 minutes vs. 133.5 ± 1.5 minutes, $p = .001$). For the ED rate of patients who LWBS, no statistically significant difference was seen between pre- and post- implementation (41/575, 7.13% vs. 46/611, 7.52%). Satisfaction scores were improved by more than 10% after implementation. The advanced triage protocols enhanced front-end throughput operations and patient experience within the ED by allowing triage nurses to initiate orders and begin pain medication. Delivering timely and efficient care to meet various patients' needs has the potential for a positive social change through improved health care outcomes; perception of care; and trust between patients, providers, and the health care system.

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Dedication

I dedicate this project to my loving and supportive parent, husband, sister, and daughter. Without them, accomplishing this project would be impossible.

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Section 1: Overview of Project

Introduction

The primary role of an emergency department (ED) is to respond to emergencies and to provide the essential basic care to every human being, irrespective of their socioeconomic status. As a result, EDs may experience heavy volumes of patients who seek access to care through services provided in the ED of a health system. To further demonstrate the effect of the ED's role in care for the communities it services, the National Ambulatory Medical Care 2010 Survey, found that 136.3 million people used emergency health care service in the United States (Centers for Disease Control and Prevention [CDC], 2016). The Institute of Medicine has defined the ED as the safety net in society, as it is available 24 hours a day all year long and serves as the last resort to the underserved subset of the population (Lewin & Altman, 2000). These individuals have no choice in getting the necessary medical attention except from the ED because of lack of health insurance or access to primary care. With thousands of ED closures, lack of primary care providers, and the Patient Protection and Affordable Care Act, growth in patient volumes and demands for emergency services is anticipated. EDs face a great challenge to provide timely and efficient care because of increased volumes, crowding, and resulting prolonged wait times.

The wait time is one of the key quality indicators for safety, efficiency, and satisfaction. In 2015, all hospital EDs were mandated to report their throughput metrics to the Centers for Medicare & Medicaid Service (CMS) to get reimbursed by Medicare based on their ED quality and throughput performance. Throughput is a front-end

processing time and it includes many care based segments, including door to triage, door to medical screening exam, door to bed, and provider to discharge. A safe and effective patient flow from one segment to the next leads to efficient throughput. An ED patient starts from triage. The triage nurse uses a reliable and valid five level Emergency Severity Index (ESI) to prioritize patients and allocate right patient with right care resource at appropriate time. Based on Level 1 being most emergent to Level 5 least emergent, a patient with Levels 3 to 5 is required to wait in the waiting room area after triage if the ED beds are occupied. These patients receive no care during the waiting period besides routine assessment every 2 hours.

Having a rapid triage protocol in place for patients with an ESI rating of 3, 4, or 5 will expedite care as well as improve patient flow and throughput time. Because the need for the quality improvement initiative to address the throughput measures was so important, the practice change was implemented at the hospital and the doctor of nursing practice (DNP) students was uniquely positioned to evaluate the effectiveness of the change using secondary data obtained from the hospital. The nature of the DNP doctoral project was therefore to evaluate the implemented advanced triage protocols to determine if there was an improvement in wait times, throughput times, and satisfaction scores among patient with triage acuity of ESI 3, 4, and 5. Implications for social change is the reduced ED length of stay (LOS), reduced rates of patients who leave the ED without being seen(LWBS), and decreased complications from long wait times, thus leading to improved quality of care and health care outcomes.

Section 1 will cover the problem statement, the purpose of the project, the nature of the project, significance of the study, and, finally, a summary.

Problem Statement

The study hospital ED A has experienced a significant increase in patient volumes and demands in the last decade with a projected upward trend in number of ED visits and crowding anticipated in the near future. The longer wait times jeopardize patient safety, health outcomes, and quality of care. Negative patient satisfaction, perception of care, and engagement will be affected if wait time is not decreased. Without improving the ED's front-end throughput, adherence to state and federal benchmarks will remain challenging and potentially cause fiscal problems. In January 2016, the highest patient volume period of the year, the median ED length of stay, arrival to medical screening exam, and the number of patients who LWBS were double the national average. As a result, the ED A received the lowest patient score compared to the scorecard from January 2015 to December 2015. This front-end throughput data reflect serious problems related to triage, flow, and overall emergency services.

To address this problem, the hospital ED started implementing advanced nursing triage protocols with standard order set on March 1, 2016. Initiating diagnostic tests and interventions at triage without needing to contact a provider facilitates early detection, diagnosis, treatment, and referral for various diseases. Under the advanced triage protocols, nurses are likely satisfied with role expansion, ownership, and adherence to time-sensitive core measures, including a door to electrocardiograph time within 10 minutes for all chest pain patients and parenteral pain management for long bone fracture

within 60 minutes of arrival. The standardized order set was developed, approved, and evaluated by a group of ED experts and quality committees, including a DNP student, ED medical director, ED clinical director, acute care nurse practitioner, and ED nurse. The triage nurse only initiates the standard order set when no bed is available for ESI Levels 3, 4, and 5 patients who need to wait in waiting area after triage. The orders and interventions are standardized based on patient's chief complaint, including blood tests, x-ray, urine dip/pregnancy, and consulting ED physician for pain medication if long bone fracture is suspected or confirmed. The advanced triage protocol project is driven by the Lean Principle and the Plan-Do-Study-Act (PDSA) model, focusing on streamlining, time-saving, and throughput improvement.

Project Purpose

The aim of this project was to evaluate the effect of this new ED triage program with patients scoring Levels 3, 4, and 5. The following key indicators were measured: median time from arrival to discharge, patients left without service, and ED patient satisfaction scores. This was a quality improvement project to address the gap in the literature and contribute to ED A's goal of expediting front-end throughput and improving patient health outcomes. The knowledge of the effectiveness of the newly implemented triage program to meet the goals for the metrics described previously will support the continuation of the practice change and provide an impetus for sustaining the practice long term.

Nature of the Doctoral Project

The evidence that I used to address the practice focused questions included the hospital ED's throughput data measures retrospectively through the hospital electronic medical record system, including ED LOS and number of LWBS. In addition, to address the second question, I obtained retrospective patient satisfaction scores from baseline and post-implementation Press-Ganey patient satisfaction surveys. These data were used to evaluate the quality improvement project that addressed the gap in the management of high volume of patients in the ED and the need to meet ED A's goal of expediting front-end throughput and improving patient health outcomes. The outcomes improvement after the new ED triage program was expected to decrease LOS, decrease number of LWBS, and improve patient satisfaction scores.

Significance

In the last decade, the number of patients who present to the ED of this hospital has dramatically increased. This has ultimately led to the upsurge in the demands of the health care services and various other medical facilities. The intensification of the demand for emergency care has led to escalating wait times for the patient before they receive required medical attention. According to the CDC (2012), the average hospital ED wait time has increased 25% from 46.5 minutes to 58.1 minutes from 2003 to 2009. Compared with nonurban area EDs, EDs in urban areas have longer wait times, of 40 minutes versus 62.4 minutes respectively. The longer wait time directly affects throughput times, treatment time, and transfer time. Often, increased wait times also cause delays in care, quality assurance issues, and inefficiency of ED flow due to the

issue of overcrowding. From the systematic review literature, significant evidence suggests problems that are created by the overcrowding emergency care system, such as treatment delays, medical errors, patient death, patient elopement, ambulance diversion, negligence claims, and financial loss (Hoot & Aronsky, 2008). The length of wait also affects another ED metric of LWBS rate. These unevaluated patients carry a high medical and legal risk because they are highly associated with ED revisit with higher acuity and higher rates of subsequent hospital admission (Rowe et al., 2006). When the ED is overcrowded, the care and treatment delay for time-sensitive conditions will occur, including acute myocardial infarction, stroke, pneumonia, and sepsis. These publicly reported core measures and time-sensitive metrics are not only correlated to safety, quality, and patient satisfaction but they are also tied to Medicare payment reimbursement. The ED A loses significant revenue due to high patient elopement, LWBS, ambulance diversion, and readmission rate. The national metrics for ED outpatient (OP) and inpatient (IP) quality measures according to CMS's hospitalcompare.hhs.gov include the following:

- Median time from ED arrival to discharge (OP): 142 minutes.
- Median time from ED arrival to departure (IP): 262 minutes.
- Median time from ED arrival to medical screening exam: 25 minutes.
- Median time from door to electrocardiograph (OP): 10 minutes.
- Median time from ED arrival to parenteral pain management for long bone fractures: 60 minutes.
- Median time from decision to departure (IP): 90 minutes.

- Percentage of patients who LWBS: 0%.

The study reported that only 31% of EDs consistently achieved those metrics (CDC, 2016). The study ED had a hard time keeping up with these state and national metrics. Therefore, it became necessary to take steps to evaluate and improve its operation. Once the need of efficient triage is proposed, the investigator identifies and engages the stakeholder at all levels from the beginning and throughout the proposal, including Chief Executive Officer, Chief Nursing Officer, Chief Operation Officer, ED executive director, physicians, nurses, ancillary staffs, DNP student, and collaborating disciplines. AHMC Health is composed of 6 hospitals, the hospital ED A is one of them in the city of Monterey Park, California. Getting full support from all the stakeholders will lead to a successful project, and then this quality improvement project enables to be moved to multiple EDs in the area.

Implication for Positive Social Change

The role of the ED is crucial in the health care system because it acts as the major safety net in the society. Therefore, financial and quality threats to the ED compromise the health care services available to the general population and a public health crisis. At present, the most important of liabilities to the emergency care system of the United States are the overcrowding and wait time in the ED. Thus, the need to implement various strategies and cope with these issues arises while providing the necessary care to everyone. This project evaluated whether the implementation of advanced triage protocols enables ED providers to improve timeliness of throughput and patient satisfaction scores.

Assumptions and Limitations

The assumptions associated with this quality improvement project included the following: the triage nurses have fully adopted the new protocols and that data collected on throughput in the medical record was accurate. The study was limited to one ED in the western United States and may not be representative of all EDs, particularly in states where medical boards prohibit the use of nurse initiated care in the ED.

Summary

Driving an expedited and efficient ED health care service beginning at triage may result in the low acuity patients being diagnosed, treated, and discharged in a timely manner. Advanced triage protocol is a time-saving strategy that can prevent the negative consequences related to long wait time. By implementing nursing-driven protocols, patient safety and throughput can be improved and the ED can be operated more effectively and economically, producing positive health care outcomes, and perception of care satisfaction.

Section 2: Background and Context

Introduction

Every year, millions of Americans receive emergency service ranged from resuscitation care to nonemergent care. The most common reasons for ED visit are cold symptoms for children and injuries for adults (CDC, 2013). Based on the five levels of ESI, people with those complaints are categorized as Levels 4 and 5 and often return to the waiting area after triage. The low acuity contributes to longer wait time to see a provider. Although people with abdominal pain, headache, or vaginal bleeding are urgent conditions as ESI 3, they wait the longest in the ED because of diagnostic test and medication treatment. Once beds are fully occupied, ESI 3 to 5 patients must wait in the waiting area anywhere from 2 to 24 hours (National Center for Health Statistics, 2013). Prolonged wait times are correlated to negative patient satisfaction score and affect overall throughput metrics (Popovich et al., 2012). The Position Statement by the American College of Emergency Physician (2010) and the Emergency Nurse Association (2015) indicated that advanced triage protocol is essential to expedite care, improve outcome, and enhance safety. The effective triage system and treatment protocols can minimize the negative consequences related to long wait time. Thus, advanced triage protocol is important to improve throughput and satisfaction (Emergency Nurse Association, 2015).

Application of a triage protocol produces a positive result toward achievement of intended outcomes. Robinson (2013) conducted an integrative review on triage protocol. It revealed a significant LOS reduction by early protocol initiation in triage. Using

protocols in Triage, 4 studies with evidence Level 2 revealed a bell curve and statistically significant time saving from total LOS ($p < .001$) and, a 37.2- minute reduction, and time saving ranged from 8.5 to 60.5 minutes (Robinson, 2013). Patient satisfaction was not fully measured in any of the studies. However, two studies showed the positive trends in the survey. The review supports the triage protocol to use this time-saving and nurse-driven method to avoid a crowded waiting room and improve ED throughput (Robinson, 2013).

Using standard order sets in the hospital has showed to improve more than 50% care process, decrease mortality from 48% to 10%, reduce time to medical screening exam from 31 to 15 minutes, and time to imaging test from 120 to 40 minutes (Bair et al, 2005). The standardized order sets are complaints and symptoms based, the triage nurses initiate the order sets based on their nursing assessments and findings, and the evidence-based tests and interventions are imitated based on a clear parameter. From the studies, application of this nurse driven protocols has positively affected flow efficiency, mortality reduction, overall LOS metric improvement, and core measure compliance (Ballard et al., 2008; Munoz et al., 2011).

Hunter (2010) has found that 36% of pretreatment time can be saved if an x-ray is ordered by the triage nurse. The study further stated that pain management from triage could alleviate pain and promote patient satisfaction (Hunter, 2010).

Concepts, Models, and Theories

The concept of Lean Principles and the Model for Improvement are adapted for this project. The lean management principles were developed by Japanese manufacturing

companies in 1987 and intend to remove the waste and improve work flow through the system (Joshi & Ransom, 2014). The key concept in lean thinking is to eliminate expenditure of energy so that all the values can add on to meet the customer's needs. The Lean Principles have been successfully applied in the health care system and produced a positive impact on quality, productivity, and timely delivery of health care (Institute for Healthcare and Improvement, 2016). The five core steps in the lean principles include (Murrell et al., 2010).

- Step 1: System evaluation
- Step 2: Waste identification
- Step 3: Waste elimination
- Step 4: Improved flow creation
- Step 5: Constant adaption to change

In the first system evaluation step, the investigator conducts a careful evaluation through a direct observation of patient flow, triage process, and throughput operation. Upon arrival in the ED, patients will be registered in the electronic tracking system and queued for a triage nurse. Patients wait an average of 10 to 20 minutes before seeing a triage nurse. Once the triage nurse is available, a comprehensive assessment will be conducted and it takes 5 to 10 minutes. After triage, patient will be sent to the waiting area for a bed assignment. Regardless of bed availability, the low acuity ESI 3, 4, and 5 patients are likely to be left waiting. A value stream map is developed and unnecessary wait time is identified from current triage process.

In the waste identification step, the investigator identifies non-value-added steps. Upon arrival in the ED, the serial registration intake and extensive triage are considered a waste. The Emergency Medical Treatment and Labor Act necessitates the ED to provide medical attention to every patient coming, even in cases when patient is not able to pay for the health care service. Insurance inquiry prior to treatment is prohibited by this law and ED should propose bedside registration or aftercare registration (Eitel et al., 2010). The comprehensive patient assessment by a triage nurse can be problematic during the ED crowding. The American College of Emergency Physicians (2006) suggested that the brief triage process which consists of chief complaint, vital signs, allergies, and ESI level.

In the third waste elimination step, the entrance registration intake and extensive triage steps will be removed. The entrance registration and extensive triage will be eliminated as these non-value-added steps can hamper arrival to ED care. The long registration and patient assessment process at arrival add no value in patient's ED visit. Both registration and triage process are analyzed and streamlined.

In the fourth improved flow creation step, the standardized triage workflow will be established. When there are available beds, patients should be brought straight to the treatment area where a brief triage, bedside registration, and medical screening exam are conducted simultaneously. When there is no available bed, the triage nurse should initiate standard order sets for ESI 3, 4, and 5 if indicated. The standard order sets initiated by the nurse are approved and supported by American College of Emergency Physicians (2010), CMS (2013), and Emergency Nurse Association (2015). The standard order sets are predetermined collections of departmental orders that are consistent with high quality of

emergency care. The initiation of this standing order is based on nursing assessment and it has been recognized as a strategy to expedite care, improve flow, and enhance safety (American College of Emergency Physicians, 2010). The hospital ED A's standard order sets are created and approved by the hospital interdisciplinary committee and medical executive committee; it integrates ESI brief triage process into advanced triage protocol.

In the last constant adaption to change step, a constant re-evaluation to refine the process and practice in the system is maintained by the quality and throughput committees. Application of the Lean Principles requires commitment from all of the leaders and staff, in addition to their involvement in a redesign and modification process to provide value to the patients. An ongoing monitoring and evaluation should be maintained to make a necessary change in the health care system. This bottom-up-business philosophy of lean management is rooted in process improvement and waste elimination. Creating a lean thinking culture in the system will be the driving force of this proposal to reduce waste, provide a value-added step, and increase speed-appropriate care for every type of ED patient.

The Model for Improvement

The original Plan, Do, and Inspection model for improvement was created and published by Shewhart in the 1920s and then a statistic professor and physicist Deming modified it to Plan, Do, Study, Act (PDSA) cycle for continual improvement in 1950 (Joshi & Ransom, 2014). Based on Deming's PDSA cycle and system of insightful knowledge, Associates in Process Improvement developed the model for improvement that intends to accelerate change and improvement in processes and outcomes (Institute

for Healthcare and Improvement, 2016). The Model for Improvement is a change model that has been recognized as a powerful tool for quality improvement in various health care settings. The Model for Improvement has two key components, including three improvement questions and PDSA cycle (Institute for Healthcare and Improvement, 2016; see Figure 1).

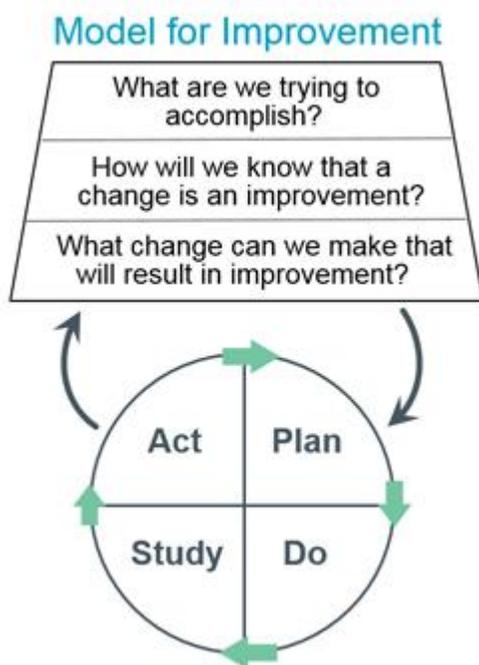


Figure 1. Model for Improvement.

The three improvement questions seek the answers to serve as a solid foundation for the improvement efforts. To answer the first improvement question, the team sets the measurable aims that outline the timeline, specific population, and intended outcome. To answer the second improvement question, the team quantifies measures illustrate beneficial changes. To answer the third question, the team brainstorms the ideas for potential changes (National Institute for Children’s Health Quality, 2016).

The second component of the Model for Improvement is the PDSA cycle and it is comprised of four steps. This is a never-ending scientific testing cycle through the process of trialing, learning, and further trialing of new ideas. The first Plan step begins with creation of aim statement, stakeholder's engagement, and team assembling, and current approaches examination. The second Do step is to implement the evidence-based practice guideline and collect data to track key metrics, problems, and variables. The third Study step is to analyze the data and evaluate the process. Based on the findings and outcome analysis, the repeating Do and Study steps may be necessary to revise process. The last Act step is to fully implement the evidence-based guideline. The team continues to implement, evaluate, re-implement, and reevaluate the process through the PDSA cycle, producing new evidence-based practice guideline (Institute for Healthcare Improvement, 2016). The Model for Improvement will provide the foundation in all stages of this project.

The Model for Improvement has been used to reduce delays in referral in the memory clinic and has yielded the successful results in referral to initial assessment time reduction from 35.7 weeks to 9.3 weeks and referral to diagnosis time decreased from 15.1 weeks to 14.2 weeks (Perry et al, 2014). The study indicated that PDSA cycle is an effective tool to shorten the referral to initial assessment and treatment time (Perry et al, 2014).

In another study, Robbins et al. (2013) noted the remarkable improvement in medication reconciliation compliance from 0% to 100% by using the Model for Improvement. It improved the patient safety and clinical pharmacy service lines by a

variety of steps, including medication access centralization, medication reconciliation guideline formation, and electronic tracking system adoption (Robbins et al, 2013).

Lastly, the Model for Improvement has been employed to test the cause and effect relationship between patient satisfactions and wait time in an outpatient clinic and has showed positive results (Michael et al, 2013). The wait time is decreased from 5.33 minutes to 1.81 minutes after the model implementation (Michael et al, 2013). The study approved that the PDSA cycle is a simple and powerful tool to improve wait time and patient satisfaction.

Definitions of Terms

Medical Screening Exam (MSE): It serves as the documentation for provider time. It involves a wide spectrum of action from a simple physical exam and history to a complex procedure (CMS, 2009, p. 20).

Door to provider times: Measure of time in minutes when the patient arrived in the ED to the moment when the patient was seen by a provider.

Length of Stay (LOS): Measure of the total length of time in minutes between patient arrivals to patient department from the ED.

Left without being seen (LWBS): Measure of patients who presented to ED requesting care but left without being evaluated by the provider.

ESI: Patient acuity scale used by the ED.

ESI 1: Immediate life- saving interventions.

ESI 2: High risk situations e.g. confused, disoriented, lethargic, severe pain, suicidal ideation or attempt.

ESI 3: Requires 2 or more resources e.g. laboratory, x-ray.

ESI 4: Requires 1 resource.

ESI 5: Requires 0 resource.

Relevance to Nursing Practice

In the separated Position Statement of the Institute of Medicine, American Academy of Emergency Medicine, American College of Emergency Physicians, and Emergency Nurse Association, crowded ED has become a national concern that contributes to hospital operation failure and poor quality of care (McHugh et al, 2012). The each organization's statement also suggests that hospitals should invest time, resources, and research to solve the crowding. Several solutions are recommended to address the crowding, including patient flow strategies, best practice strategies, process improvement techniques, workflow mapping, and bedside registration (Eitel et al, 2010). As ED is complex in its design, size, and capacity, there is no single solution to reduce the ED crowding and improve throughput. According to Mirhaghi et al. (2015), the ESI has significant effects on patient prioritization, resource allocation and in increasing the accuracy and efficiency of triage process. Although this is a reliable and valid triage tool to segment incoming patients based on their severity, it does not dictate a concrete wait time and treatment. Bedside triage is considered the best practice because of the immediate bedding and processing of the patient without the prolonged upfront triage (Sulfaro, 2013). The concept of "pull to full" of bedside triage eliminates the logistical triage area and facilitates immediate assessment, diagnosis, and treatment. Several studies have showed the promising results of this strategy in LOS, LWBS, and front-end

bottleneck volume reduction (Chan et al, 2005; ACEP, 2006; Welch, 2010). Pivot nurse, brief triage, team triage, and patient tracking system are also proposed to streamline the time-consuming upfront triage (ACEP, 2006). Implementation of an advanced triage protocol is important to nursing practice because it supports the Institute of Medicine concept that nurses practice to the full extent of their education. It adds to the nursing literature on ED nursing practice, as this topic has not been explored fully in the literature to date.

Local Background and Context

The study hospital ED has experienced a significant increase in patient volumes and demands in the last decade with a projected upward trend in the number of ED visits and crowding anticipated in the near future. The longer wait times jeopardize patient safety, health outcomes, and quality of care. Negative patient satisfaction, perception of care, and engagement will be affected if wait time is not decreased. Without improving the ED's front-end throughput, adherence to state and federal benchmarks will remain challenging and potentially cause fiscal problems. In January 2016, the highest patient volume period of the year, the median ED length of stay, arrival to medical screening exam, and the number of patients who LWBS were double the national average. As a result, the ED A received the lowest patient score compared to the scorecard from January 2015 to December 2015. This front-end throughput data reflects serious problems related to triage, flow, and overall emergency services.

Role of the DNP Student

As an ED educator and a member of the ED committee, I have introduced several evidence practices in the ED to improve ED patient flow and throughput performance. Advanced triage protocol method was one of them, but it was not evaluated after implementation. As a DNP student, I selected the form of evaluation related to ED practice as my DNP project and the center of my role was to evaluate the previously implemented advanced triage protocols to determine its merit and worth in improving throughput metrics and patient experience. The evaluation of advanced triage protocols and their functionality was an imperative activity for assessing successes for sustenance or identifying barriers for improvement. A major impetus for me was to determine the most effective intervention to improve ED patient flow and practice in relation to patient outcomes and to foster the ensuing change in culture. The Walden University, Minneapolis, Institutional Review Board and the ED Executive Director approved the DNP project to use aggregated, deidentified patient data for evaluation. Although I did not possess any biases and human subjects were not involved, I took every precaution and ethical consideration to protect privacy and confidentiality.

Summary

Application of advanced triage protocols produces a high-quality care as well as enhanced safety and patient satisfaction. A goal of standard order set initiated by nurse is to eliminate long wait time, speed up the ED throughput, and promote a better outcome by early diagnosis and treatment. Based on an integrative review, standard order sets carried in triage have demonstrated positive effects on ED LOS, patient satisfaction, workflow efficiency, and core measures compliance (Ballard et al, 2008; Robinson,

2013). Basing advanced triage protocol on the Lean Principles and the Model for Improvement shifts towards a framework of expediting high quality care for patients with low acuity level.

Section 3: Collection and Analysis of Evidence

Introduction

The advanced triage protocols were generated and approved by the medical executive committee, ED committee, interdisciplinary committee, nursing council, and governing body of the organization prior to this study. They had been implemented in the hospital ED A for 9 months without an evaluation. The roles and functions of triage nurses are defined under the policy of advanced triage protocols in the ED policy and procedures. When the ED beds are all occupied, the triage nurses initiate the order sets for low ESI (3-5) patients with common symptoms or complaints based on a clear parameter and practice guidelines. This ED nurse driven protocol allows the initiation of laboratory tests, x-rays, urine-dip for pregnancy/urine analysis, ultrasound, and analgesia administration for patients with abdominal pain, vaginal bleeding, headache, and injuries based on nursing assessment and ESI levels. In this section, I outline the practice focused questions, sources of evidence, analysis and synthesis, and a summary.

Practice-Focused Questions

In this quality improvement project, I tested two research questions: (a) Does use of advanced triage protocols improve throughput metrics? and (b) Does the use of advanced triage protocols improve patient satisfaction scores?

Sources of Evidence

The aim of this formative program evaluation was to evaluate a new triage protocol that was already implemented in the ED. I used a pre-and post-implementation design. The study setting is a 14-bed ED in Southern California and it served

approximately 100 patients per day and 26,000 annually (The Hospital ED, 2016). To answer the first research question, I retrieved and reviewed the hospital ED's throughput data measures retrospectively obtained through the hospital electronic medical record system, including ED LOS and number LWBS. To answer the second research question, I collected retrospective Press-Ganey survey data and compared the patient satisfaction scores from baseline and postimplementation.

Analysis and Synthesis

Data Collection

The hospital administrator and ED executive director provided administrative data retrieved from the hospital electronic medical record system. The quality improvement initiative was implemented in the ED in January, 2016. No previous evaluation of initiative was conducted by the hospital; therefore, the hospital needed the formal evaluation, which was the purpose of this project.

The data collection for this quality improvement project started with the approval from Walden University IRB. After obtaining approval, I obtained data from the hospital which included only the deidentified data for retrospective review before and after advanced triage protocol implementation. The throughput data measures included LOS and LWBS. The patient satisfaction data were collected from Press-Ganey patient satisfaction surveys and the CMS publicly reported data website. Preimplementation deidentified patient data were collected from July 1, 2015 to December 31, 2015. Postimplementation deidentified patient data were collected from July 1, 2016 to December 31, 2016.

Data Analysis

I employed descriptive statistics to calculate means LOS on the discharged patients and LWBS rate.

Question 1: Does the use of advanced triage protocols improve throughput metrics? The throughput of LOS, and LWBS were analyzed by calculating means, standard deviation (SD), *t* test, and chi-square using SPSS version 21. A statistical significance of $p < .05$ was used and measured. The outcomes of LOS and, LWBS were compared using a *t* test to determine if there was a significant difference after the protocol implementation.

An independent *t* test was used when the participants in the baseline group and post-implementation group were not the same people; the *t* test was used to determine the difference between two groups means and SDs (Polit,2010). A chi square of independence was used for total LOS and LWBS when both the independent and dependent variables were measured on a percentage scale (Polit, 2010). The variables included the number of participants (ESI 3, 4, and 5), LWBS before protocol, LWBS after protocol, LOS before protocol, and LOS after protocol.

Question 2: Does the patient satisfaction score improve after using advanced triage protocols? I focused on the survey questions of wait time to see a patient, overall physician, overall nursing, overall ED, and likelihood to recommend from the Press Ganey patient satisfaction scores (Press Ganey Association, 2016). The patient satisfaction percentiles on these areas were compared before and after the protocol implementation period.

Summary

The two questions would answer by the comparing the results of pre-and post-protocol implementation. Based on findings of my literature review, the stakeholders are likely engaged and participate in the project because of potential positive outcomes. By using secondary data, I was able to study other deficiencies related to wait time and crowding to refine the protocol for a much larger scale.

Section 4: Findings and Recommendations

Introduction

The growth in ED volumes and prolonged ED wait time have resulted in increased length of ED stay, number of patients who LWBS, and patient dissatisfaction. The advanced triage protocols has been developed and reported to expedite the front-end processing of patients by initiating disease-specific states management at triage, including pain medication administration, ordering diagnostic studies, and institution of elopement precaution (Wiler et al., 2010). The 14-bed ED in Southern California has been struggling to provide timeliness of care to low-acuity patients during periods of full capacity and surges. A nurse-driven protocol incorporating the standard order set was created and implemented by the ED in January, 2016, to address the prolonged wait times, increased length of stay, and increased number of patients who LWBS. The aim of this project was to evaluate the effect of advanced triage protocols on the overall throughput metrics and patient satisfaction scores. This analysis included 19,899 discharged ED patients, with 9,348 in the preimplementation group from July 1, 2015, to December 31, 2015 and 10,551 in the postimplementation group from July 1, 2016, to December 31, 2016. Using advanced triage protocols would benefit the patients with lower acuity because they were frequently sent back to the waiting room after triage, so the analysis focused on patients with ESI Levels 3 to 5. In this section, I outline the findings, implications, recommendations, strength and limitations, and a summary.

Discussion of Findings

To complete the evaluation, findings of the analyses of the two questions used to evaluate QI initiative in the ED were discussed in the section. The statistical significance was found between preimplementation and postimplementation ED LOS and number of LWBS among ESI Levels 2 to 5 patients (Table 1). For ED LOS, there was a statistically significant 17-minute decrease for ESI Level 3 patients between pre- and post implementation of advanced triage protocols (225.7 ± 8.6 minutes vs. 208.8 ± 6.9 minutes, $p = .002$). A statistically significant 13-minute decrease for ESI Level 4 patients (146.5 ± 1.6 minutes vs. 133.5 ± 1.5 minutes, $p = .001$) was found. No significant difference was found in ESI Level 2 patients (232.8 ± 3.6 minutes vs. 234.7 ± 3.2 minutes, $p = .47$) and ESI Level 5 patients (109 ± 8.8 minutes vs. 114.4 ± 2.9 minutes, $p = .14$) during days with implementing advanced triage protocols compared with days without implementing advanced triage protocols. Frequently, the ESI Level 2 patients are immediately placed in a room and examined by an ED physician upon their arrival. The ESI Level 5 patients do not require any resources. Thus both level of patients are not directly affected by the advanced triage protocols implementation.

Table 1
Throughput Metrics ED Length of Stay for ESI Levels 2 - 5

	Before protocols	After protocols	<i>p</i> value for pre vs. postprotocol comparison	CMS out-patient throughput target
ESI 2 LOS	234.7 ± 3.2	232.8 ± 3.6	.47	
ESI 3 LOS	225.7 ± 8.6	208.8 ± 6.9	.002	
ESI 4 LOS	146.5 ± 1.6	133.5 ± 1.5	.001	135
ESI 5 LOS	114.4 ± 2.9	109 ± 8.8	.14	

Note. LOS values are expressed as means (minutes) with 95% confidence intervals. * $p < .05$; ** $p < .01$; *** $p < .001$.

For ED number of LWBS rate, there was no statistically difference between the pre- and post-implementation of the advanced triage protocols (Table 2). The p value for pre- versus post-protocols comparison was 0.07 during the days with advanced triage protocols (41/575, 7.13%) compared with days without protocols (46/611, 7.52%). Although the overall rate of LWBS was not significantly different, patients who LWBS had lower triage acuity during days with advanced triage protocols ($M = 3.7$, $SD = 0.7$) compared with days without advanced triage protocols ($M = 3.6$, $SD = 0.7$, $t = -6.3$, $p < .001$). Before the triage protocols, one third ($n = 15$) of LWBS patients were ESI Level 3, compared with after the advanced triage protocols, when the rate was 24.4% ($n = 10$; $\chi^2 = 10.1$, $p = .001$). Among those who LWBS before the protocols, 65.2% ($n = 30$) were ESI Level 4 patients compared with 61.3% with after the protocols ($n = 25$; $\chi^2 = 6.7$, $p = .009$). For the LWBS rate, the largest shift was found amongst the ESI level 5 patients between pre and post implementation (2% vs.10.2%, $\chi^2 = 71.5$, $p < .001$).

Table 2
Throughput Metrics ED Patient Left Without Being Seen

	Before protocols n (%)	After protocols n (%)	p value for pre vs.post protocols
LWBS	46 (7.52%)	41 (7.13%)	.07
Total	611	575	

Note. Values are expressed as number (percentages). * $p < .05$; ** $p < .01$; *** $p < .001$. Total includes the number of left without being seen, left before treatment completed, and elopement. LWBS, leaving without being seen.

A more than 10% patient satisfaction scores improvement was found in the post a protocols implementation survey (Table 3). The patient satisfaction score related to the wait time to see a physician was up to 65% after the protocols compared with the 51%

before the protocols. The patient satisfaction score related to overall ED was improved by 14% from 54 percentile before the protocols to 68 percentile after the protocols.

Table 3
Press Ganey Patient Satisfaction Scores for ED patients

	Before protocols	After protocols
Wait time to see a physician	51	65
Overall ED	54	68

Note, ED, emergency department.

The advanced triage protocols allowed the initiation of diagnostics, medication administration, and management of specific disease conditions by a triage nurse that improved the ED front-end throughput and patient satisfaction in this present evaluation. The implementation of advanced triage protocols reduced the ED LOS and increased the patient satisfaction scores. The result is consistent with the study by Svirsky et al. (2013) that found a reduction in LOS and an improvement in patient satisfaction. In Svirsky et al., ED LOS improved dramatically in a 42-bed ED in the United States. Typically, patients who are triaged as ESI Level 3 need many resources and ESI Level 4 use one resource, including the laboratory, imaging, medication, and procedure. They often experience longer wait time before they receive testing and treatment. A key principle with the advanced triage protocols is to keep moving patients through diagnostic areas; the early diagnostic testing can lead to an early medical decision and favorable discharge disposition. The advanced triage protocols were developed to expedite the diagnostic testing, evaluation, and treatment, particularly for ESI level 3 and 4 patients. Thus, it was not surprising to find a dramatic improvement on ED LOS and LWBS for ESI level 3 and 4 patients.

Implications

The advanced triage protocols were associated with a reduction in ED LOS and an increase in patient satisfaction score, but reduced LOS did not result in a change in the rate of LWBS in this evaluation. Given the relatively six months of throughput data in one facility, the statistical difference between baseline and post protocols may not be fully detected. Additional evaluations should be conducted in the future to find differences.

This present evaluation revealed that nurse-driven protocols and nursing initiatives promoted positive patient outcomes and patient experience. Historically, the triage nurses was not taught to initiate orders for diagnostic testing and administration of pain medication based on their nursing assessment in the nursing program or organization. Lack of knowledge, skill, and understanding can lead to over-ordering, under-ordering, or noncompliance, resulting in unintended consequences and unfavorable health outcomes. An implication is that health care organizations and nursing schools need to provide in-depth triage education and training program, emphasizing nursing assessment, diagnostic evaluation, and treatment for specific disease conditions.

When the wait times and length of ED stay decrease, patients will receive a fast, and effective emergency care to restore their health from the illness. Using advanced triage protocols to improve ED flow and efficiency can promote the positive image of ED, perception of care, and patient experience. Without patient engagement, there will be no patient-centered care and desirable outcomes. The positive social change is that EDs resume its role to consistently deliver safe, timely, and quality clinical care to every

patient. The innovative strategy of advanced triage protocols contribute to the positive social change by expediting the emergency service process and expanding the role of nurses.

Recommendations

Consistent with the Position of Statements by IOM, ACEP, and ENA, advanced triage protocols have a measurable impact on ED patient flow and patient experience. The findings of this evaluation demonstrated that advanced triage protocols implementation correlated with a reduction of ED LOS and an increase of patient satisfaction score. However, the rate of LWBS was not affected with expedited diagnostic evaluation and treatment by implementing a nurse-driven protocol, particular for ESI 4 and 5 patients who present for a need of medication refill, suture removal, recheck, and a prescription. In order to reduce the number of LWBS amongst these low-acuity patients, incorporating a provider in triage as well expanding the staffing and place are recommended. The low-acuity patients can be seen and discharged by a provider from the triage or a designated space. Quick moving patients with ESI level 4 and 5 in and out of the ED may fix high proportion of LWBS rate.

Strengths and Limitations

One of the strengths of advanced triage protocols was nurse's role expansion that gave them a sense of satisfaction and success, particularly when the diagnostic evaluations confirm their suspicions of disease or quick moving patient from triage to diagnostic testing lead to favorable discharge disposition. The other strength was a great collaboration amongst a multidisciplinary team of ED and hospital staffs. Once the staffs

realized the advanced triage protocols were making a more efficient process, they worked collaboratively to facilitate a change in practice.

Despite having a senior nurse in triage and extensive training program prior to implementation, the over-ordering and under-ordering by a triage nurse did exist. The deviation from the standardized order set by the triage nurse could be either lack of education or buy-in problem. The unnecessary workup and medication administration were highly associated with unintended consequences and cost inefficiencies. However, the issue of over-ordering or under-ordering was addressed and controlled by the ED leadership team at the planning and implementing stage.

Additional limitation was the advanced triage protocols did not impact the rate of LWBS. Although the advanced triage protocols expedited the diagnostic evaluation and reduced LOS, it did not improve the number of LWBS amongst the lower acuity patients. Even though there was no statistical difference in the rate of LWBS between pre-implementation (7.52%) and post-implementation (7.13%), but the largest shift was found in the lowest acuity patients. It meant that mitigating the rate of LWBS must be multifaceted and the strategies must be met the type and demand of patients. The ED was under remodeling 4 months before the implementation, the environmental factor should be considered in the future evaluation.

The evaluation conducted in one facility may lessen generalizability and the results may not be generalized for all the EDs. Future evaluations should conduct in multiple facilities and allow more time for evaluations.

Summary

The findings from evaluation indicated that advanced triage protocols led to decreased ED LOS and improved patient experience. However, there was no statistical significance among the numbers of LWBS. The future research is essential to evaluate the effective method to reduce the rate of LWBS and to determine the best model to improve ED flow and throughput metrics. The advanced triage protocol program was an effective and feasible intervention that expedited the front-end processing of low acuity of ED patients, promoting LOS reduction, patient satisfaction, and greater collaboration among staff.

Section 5: Dissemination Plan

Introduction

After 1 month of data analysis and interpretation, I have answered my practice-focused questions. Once the results are obtained through evaluation, it is essential for DNP students to disseminate what they found to the internal and external audiences. Dissemination of findings does not only allow others to see its values but also bridge the gap between literature and ED practice. There is a variety of methods for dissemination, including presenting the work at a research day at the organization, presenting it in a poster at a conference, or publishing it in a journal. In this section, I outline the dissemination plan, analysis of self, and a summary.

Dissemination Plan

Once the findings are organized in a PowerPoint and poster format, I will present the work to the primary stakeholders at ED committee meeting at the organization, including ED administrators, chief nursing officer, medical director, clinical director, quality improvement director, team leader, and ED nurses. It is important to let them see the worth and merit of evidence-based practices (EBP) so that they can continue to support EBP in changing in practice and improving patient care. I may gain more supporters for a change in practice if the project has a positive financial effects on CMS performance metric and a reduction of LOS with an increase patient seen in the ED. ED staffs are the internally targeted audiences, the small or large group presentations can be delivered through grand rounds, staff meeting, and ED education day. After

dissemination of the finding at the ED, it is important to disseminate the information at a research day for all staffs at the organizational level.

This was a QI project evaluation for ED quality and throughput performance, so the findings will be beneficial for other ED nurses who experience similar problems in their settings. To disseminate the findings to the external audiences, a poster will be planned and presented at local, state, and national ED conferences. Publishing evidence-based practice results in a journal is the most effective way to reach broader audiences to provide evidence for practice change (Wolf, 2015). In addition, I will choose to publish my work in print in the *Journal of Emergency Nursing* and online in ProQuest. The poster, presentation, and publication require a clear, accurate, and readable abstract for acceptance; the author should follow through the American Psychological Association's abstract guidelines (White & Dudley-Brown, 2012).

Analysis of Self

Throughout the DNP project journey, my professional role has expanded as a practitioner, scholar, and transformational leader. It has become my routine practice to assess whether the current EBP are being adopted, whether the EBP is fit into the organization, and whether they are producing the desired outcomes for the patient. Through ongoing assessment and quality monitoring, I am capable to identify the strengths and barriers, deliver evidence-based feedback, drive organizational changes, and promote an EBP working culture. As an advanced practice nurse, I use my learned clinical, organizational, and leadership skills to analyze the data, monitor outcomes, and refine the practice guidelines and areas for improvement on a daily basis. As a scholar, I

critique research studies and results to seek what can be adopted to support the change. Even though the QI project evaluation is conducted at a single site, sharing the findings can contribute to body of knowledge for advanced triage protocols and bridge the gap between literature and emergency practice. As a transformative leader, I motivate people to change, empower people to launch change initiative, and model the way to success. Change is not always easy, I will continue to support the staff by listening their concerns, providing the resources, and making timely adjustments. My expanded professional roles enable me to deliver the highest possible quality of care in the future, emphasizing interdisciplinary collaboration, best practice adoption, effective communication, and advanced technology use.

I have received numerous help and support from DNP project committee chair, commit members, preceptor, and my family to complete this QI project evaluation. The most significant challenge for me is to analyze data and summarize them into a report. I have to review my statistical analysis skill to overcome this challenge. This scholarly journey is quite daunting and each step is steep, but it is worthwhile for my professional and personal growth.

Summary

The dissemination is a critical step in the research process because it involves sharing the results with audience onsite and outside. The value of new practice or knowledge can be seen and adopted by many EDs with similar practice problems. Choosing multiples dissemination methods will result larger audiences and better diffusion of evidences. Through analysis of self, I realize that I have so many gains

throughout this DNP project journey, including professional role expansion, professional growth, and personal growth. I have learned that there is nothing I can not accomplish if I marry commitment, vision, and perseverance.

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